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PUBLICATIONS AND PATENTS

of the
NORTHERN UTILIZATION RESEARCH AND DEVELOPMENT DIVISION
Peoria, Illinois, for the period
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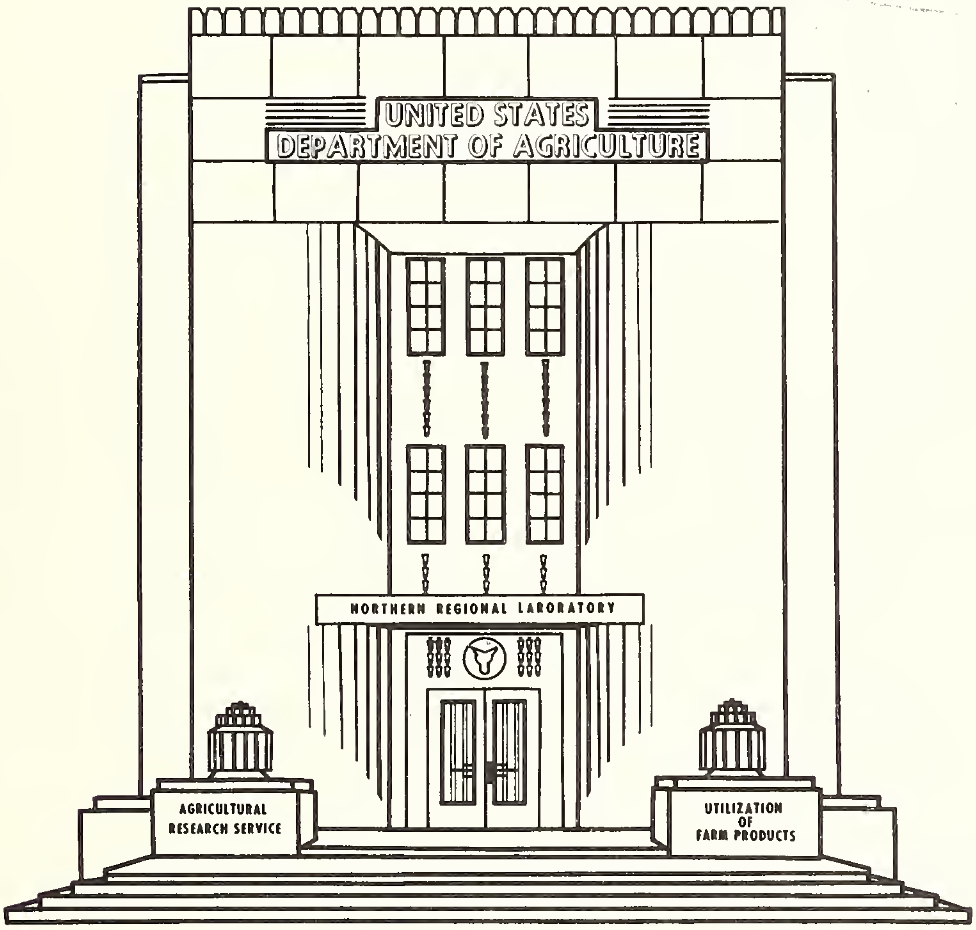
UNITED STATES
DEPARTMENT OF AGRICULTURE
NORTHERN REGIONAL LABORATORY
AGRICULTURAL RESEARCH SERVICE
UTILIZATION OF FARM PRODUCTS

Agricultural Research Service
UNITED STATES DEPARTMENT OF AGRICULTURE

Congress in 1938 authorized four regional laboratories to conduct basic and applied research designed to expand, improve and develop through science and technology the utilization of American farm crops. Agricultural products assigned the Northern Division for study are: *The cereal grains*--corn, wheat, grain sorghum, and oats; *the oilseeds*--soybean, flaxseed, safflower, and erucic acid-containing oilseeds; and *new crops* screening. The abstracts in this list describe current research activities and indicate progress achieved by the Northern Division.

Northern Division publications are available, in conformance with the policy of the Department of Agriculture, to scientists and other specialists, librarians, representatives of the press, and others interested. Titles of publications no longer available are marked with an asterisk (*).

Requests for specific reprints should be addressed to: Northern Utilization Research and Development Division, 1815 North University, Peoria, Illinois. Mailing lists are not maintained except for the list of Publications and Patents.

Most of the publications are reprints of articles published in journals that are available in libraries. Any one who needs information may obtain it most efficiently by consulting a technical library. Photographic copies of most journal articles on research at this Division can be purchased from the Library of the U. S. Department of Agriculture, Washington 25, D. C.

No publications will be sent regularly in response to foreign requests unless exchange arrangements have been made with: Director, Library of the Department of Agriculture, Washington 25, D. C.

Printed copies of patents, which are assigned to the Secretary of Agriculture, can be obtained only by purchase (25 cents each) from the Commissioner of Patents, U. S. Patent Office, Washington 25, D. C. Order by number, do not send stamps.

Previous lists of publications and patents were issued as NM-305, AIC-187, and AIC-318, with supplements. Copies of these lists are available on request.

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PUBLICATIONS

[Publications marked (*) are not available for distribution.]

CAPE MARIGOLD: IS IT A NEW CROP IN THE MAKING?

Quentin Jones[1] and Ivan A. Wolff. [1](USDA Crops Research Division, Beltsville, Md.)
Chemurgic Dig. 19(1): 4-5. January 1960.

Discovered in a search for useful new oilseeds, the seed oil of the cape marigold provides a new reactive fatty acid, named dimorphecolic acid. One species *(Dimorphotheca aurantiaca)* out of the 60 or so species of cape marigold, and closely related *Osteospermum* ornamental flower, has been under cultural evaluation for 2 seasons. Growth characteristics of the plant and potential industrial uses for the oil are briefly described.

CORRUGATING PULP FROM WHEAT STRAW BY COLD SODA PROCESS.

A. J. Ernst, T. F. Clark, and I. A. Wolff.
TAPPI. 43(1): 34-37. January 1960.

Cold soda pulping was appraised for its applicability to the preparation of corrugating pulps from wheat straw. Whole and chopped straws were steeped for 1, 3, and 5 hrs. with 6 to 16% caustic soda based on straw. Various vacuum and pressure impregnation treatments were investigated. A 3-roll sugarcane press was used to expel steep liquor from the straw and to fiberize steeped straw. High yields, 75 to 84%, of pulps were obtained with chemical consumption of 6.2 to 7.5% from initial concentrations of 12, 14, and 16% NaOH. Pulps were converted on a 10-in. laboratory fourdrinier machine to 9-point corrugating board having high crush resistance. Re-use of steep liquor through 12 complete pulping cycles was accomplished without appreciable change in physical properties of the pulps.

GILBERTELLA GEN. NOV. (MUCORALES).

C. W. Hesseltine.
Bull. Torrey Botan. Club 87(1): 21-30. January 1960.

Choanephora persicaria Eddy has been rediscovered and studied from the type material as well as from a number of strains isolated from soil, sewage, peaches, and mulberries.

The zygosporic stage has been found and its development proves conclusively that this fungus represents a new genus, *Gilbertella*. This genus is heterothallic, possessing a *Mucor*-like sexual stage and a *Choanephora*-like asexual stage. From a study of the life cycle it is concluded that *Gilbertella* is a form intermediate between the Mucoraceae and Choanephoraceae.

When + and - strains are brought together, they produce zygospores in liquid media and form beta-carotene.

Gilbertella can cause a brown, firm type of rot in peaches with abundant sporulation over the surface of the fruit.

MIKROSKOPISCHER AUFBAU UND ZUSAMMENSETZUNG DES WEIZENKORNES UND MÖGLICHE BEZIEHUNGEN ZUR KONDITIONIERUNG. [MICROSCOPIC STRUCTURE AND COMPOSITION OF THE WHEAT KERNEL AND THEIR POSSIBLE RELATIONSHIP TO CONDITIONING.]

M. M. MacMasters, Dorothy Bradbury, and M. J. Wolff.
Getreide und Mehl 10(1): 1-4. January 1960.

The structure and composition of the mature wheat kernel are illustrated with photomicrographs and are discussed with special reference to the route of entry of water during conditioning prior to milling, and to distribution of the moisture at the end of the conditioning period. Studies in progress at the Northern Regional Laboratory, directed toward the development of reliable methods for determining how water enters the kernel and is subsequently distributed under specific conditions, are briefly described. Research which is expected to follow the establishment of these methods is outlined.

PREPARATION OF DISSOLVING PULP FROM SUGARCANE BAGASSE.

Andre H. Locus.
TAPPI 43(1): 1[illegible]-[illegible]. January 1960.

High-grade experimental pulps for production of viscose rayon were prepared from bagasse by the prehydrolysis-sulfate process. A study of hydrolyses by sulfuric acid, nitric acid, water, and steam is reported. Results emphasize the importance of hydrolytic conditions upon effectiveness of pentosan removal. High-grade dissolving pulps with 91 Hunter brightness and containing 95% alpha-cellulose, 4% pentosans, and 0.05% ash were obtained. Yield from depithed bagasse was about 33%, comparable to that from wood. The bagasse pulps were spun into rayon and the yarns evaluated. The pulps had characteristics needed for the manufacture of viscose rayon.

PREPARATION OF PURE FATTY ACID METHYL ESTERS BY COUNTERCURRENT DISTRIBUTION.

C. R. Scholfield, Janina Nowakowska, and H. J. Dutton.
J. Am. Oil Chemists' Soc. 37(1): 27-30. January 1960.

Applications are illustrated for the preparation of methyl linolenate from an 85% linolenate concentrate, methyl linoleate from safflower esters, and methyl arachidonate from pig liver lipides by countercurrent distribution using an acetonitrile-pentane-hexane solvent system. This procedure provides a source of "natural" fatty acids with the double bond configuration unchanged, in contrast to those from the conventional bromination-debromination process.

REACTIONS OF UNSATURATED FATTY ALCOHOLS. VII. POLYMERIZATION OF VINYL ETHERS CATALYZED BY STANNIC AND FERRIC CHLORIDES.

E. J. Dufek, R. A. Awl, L. E. Gast, J. C. Cowan, and H. M. Teeter.
J. Am. Oil Chemists' Soc. 37(1): 37-40. January 1960.

Variables affecting polymerization of conjugated and nonconjugated soybean vinyl ether with stannic or ferric chloride as catalyst were studied. To obtain polymers suitable for film-forming studies (4,000-6,000 molecular weight) polymerization is initiated preferably at 25° C. with 3 ml. of anhydrous toluene used per gram of monomer and 4.8 mmoles of stannic chloride per mole of monomer. Monomer purity should be at least 98%.

Ferric chloride hexahydrate initiated polymerization at 25°, but polymerization was incomplete, and the polymers had relatively low molecular weights.

RICE STRAW FOR BLEACHED PAPERS.

A. J. Ernst, Y. Fouad, and T. F. Clark.
TAPPI. 43(1): 49-53. January 1960.

Rice straws from Arkansas, Louisiana, and Egypt were studied as raw materials from which to make fine bleached papers by mechano-chemical and pressure-pulping techniques. Pulping was done with both caustic soda and kraft chemicals. An effective washing treatment was developed to remove friable leaf material and debris from the straws before pulping. No unusual equipment or techniques are required to prepare quality pulps from rice straw. Selected rice straw pulps were converted either alone or in blends with wood pulps to a variety of papers on a laboratory fourdrinier machine.

SEARCH FOR NEW INDUSTRIAL OILS. II. OILS WITH HIGH IODINE VALUES.

F. R. Earle, T. A. McGuire, Jean Mallan, M. O. Bagby, I. A. Wolff, and Quentin Jones[1]
[1](USDA Crops Research Division, Beltsville, Maryland).
J. Am. Oil Chemists' Soc. 37(1): 48-50. January 1960.

Chemical screening analyses on oils from seeds of 87 little-known plant species revealed 12 with iodine numbers ranging from 180 to 213. These oils occurred in three plant families--the Cruciferae, Euphorbiaceae, and Labiatae. Eight of the species do not have fatty acid composition reported in the literature. The percentages of the major component acids of the oils are reported here with selected physical and chemical constants. Ultraviolet and infrared spectra of these oils revealed no components or functional groups of unusual nature. The traditional value of oils of high iodine value for use in protective coatings warrants further study of those species which have desirable growth characteristics.

CHANGES IN STARCH AND GLUTEN DURING AGING OF BREAD.

F. R. Senti and R. J. Dimler.
Bakers Dig. 34(1): 28-32. February 1960.

Recent laboratory and cooperative studies relating to fundamental changes and underlying causes of bread staling are reviewed. Specifically, the work covers physical changes in bread on aging, as well as changes in starch and gluten gels, and effect of added bacterial alpha-amylase. Properties measured include moisture-sorption capacity, compressibility, or rigidity, taste-panel evaluation of freshness, and crystallinity as judged by X-ray patterns.

THE EPOXY ACIDS OF *CHRYSANTHEMUM CORONARIUM* AND *CLARKIA ELEGANS* SEED OILS.

C. R. Smith, Jr., M. O. Bagby, R. L. Lohmar, C. A. Glass, and I. A. Wolff.
J. Org. Chem. 25(2): 218-222. February 1960.

A new epoxy fatty acid has been isolated from seed oil of *Chrysanthemum coronarium* and shown to be *cis*-9,10-epoxy-*cis*-12-octadecenoic acid. It has been given the name, coronaric acid. Coronaric acid is closely related to another natural acid, vernolic acid, which has the epoxy and double bond functions transposed. Vernolic acid has now been shown to be present in *Clarkia elegans* seed oil.

FRACTIONATION OF SOFT AND HARD WHEAT FLOURS BY FINE GRINDING AND AIR CLASSIFICATION.

V. F. Pfeifer and E. L. Griffin, Jr.
Am. Miller & Processor 88(2): 5, 14-20. February 1960.

Five typical U. S. Hard and soft wheat flours and two second clear flours were fractionated by fine grinding and air classification to determine the variety of fractions possible that differ in chemical composition and physical properties.

Fractions varying in protein content from about 3% to about 28% were separated from soft wheat flours. From hard wheat flours the protein content of the fractions varied from about 7% to about 26%. Thus a wider range of compositions was obtainable from soft wheat flours than from the hard wheat flours. Regrinding both soft and hard wheat flours was quite effective in increasing yields of high- and low-protein fractions and in extending significantly the range of protein content of the fractions.

IMPROVED PROCESS FOR THE PREPARATION OF CONJUGATED SOYBEAN AND LOWER ALKYL VINYL ETHER COPOLYMERS BY FLASH POLYMERIZATION.

G. C. Mustakas, M. C. Raether, and E. L Griffin, Jr.,
J. Am. Oil Chemists' Soc. 37(2): 68-72. February 1960.

The production of conjugated soybean vinyl ether copolymers with isobutyl and ethyl vinyl ether by a simplified process is described. This work was carried out in conjunction with a pilot-plant program to prepare samples of the copolymers for industrial evaluation

Vinyl ethers were flashed copolymerized in commercial grade dried toluene using stannic chloride catalyst. Solvent selection, polymerization techniques, catalyst concentration, separation of catalyst, and recovery of solvent were investigated. An improved process for catalyst separation was obtained by a one-step chemical precipitation instead of a multiple-step solvent extraction. By the use of turbo-agitation and rapid quenching, water-white, viscous copolymers were obtained with molecular weights up to 9,500.

PREPARATION OF VINYL ETHER MONOMERS FROM CONJUGATED SOYBEAN ALCOHOL.

G. C. Mustakas, M. C. Raether, and E. L. Griffin, Jr.
J. Am. Oil Chemists' Soc. 37(2): 100-103. February 1960

New Processing studies on the preparation of vinyl ether monomer from conjugated soybean fatty alcohol are described Acetylene was reacted with the fatty alcohol at atmospheric pressure in the presence of potassium hydroxide catalyst. The rate of vinylation was proportional to the flow-rate of acetylene. High flow rates of 2.4 l./min./kg. reduced the total reaction period to less than 1 hour. Optimum vinylation yields were obtained at 180-190° C with the use of 4% potassium hydroxide based on the weight of fatty alcohol. Distillation of the crude vinylation liquors yielded 98-99% pure vinyl ether The overall yield of quality monomer that could be polymerized was 80 6%

REACTIONS OF UNSATURATED FATTY ALCOHOLS. VIII. PREPARATION AND PROPERTIES OF SOME COPOLYMERS OF NONCONJUGATED LINSEED VINYL ETHER AND LOWER ALKYL VINYL ETHERS.

L. E. Gast, Wilma J. Schneider, J. L. O'Donnell, and H. M. Teeter.
J. Am. Oil Chemists' Soc. 37(2): 78-80. February 1960.

Polymers and copolymers of nonconjugated linseed vinyl ether were prepared in benzene using stannic chloride catalyst. Comonomers used with nonconjugated linseed vinyl ether were ethyl, isopropyl, *n*-butyl, isobutyl, *n*-octyl, 2-ethylhexyl, 2,2-dimethylpentyl, 2-chloroethyl, and 2-methoxyethyl vinyl ethers.

A nonconjugated linseed polymer, and certain of its copolymers, produced satisfactory films when dried in air at room temperature. Baked films of the nonconjugated linseed polymer and copolymers were wrinkle-free, moderately hard, and flexible; and they had excellent adhesion to substrates like glass, black iron, and aluminum. The films were unusually resistant to acids, alkali, and most organic solvents.

USDA RESEARCH MAY PUT MORE U.S. SOYBEANS IN JAPANESE FOODS.

Dean H. Mayberry.
Soybean Dig. 20(4): 20-21. February 1960.

Reports briefly on research in the use of U. S. soybeans in traditional Japanese foods, such as miso and tofu, and on the background that led to the research. Announces a process for making miso from grits that is faster than the traditional method, which is outlined. Reports that U. S. soybeans can be used in Japanese whole-bean, food processes but that the U. S. varieties differ in their acceptance by Japanese processors.

DIMORPHECOLIC ACID--A UNIQUE HYDROXYDIENOID FATTY ACID.

C. R. Smith, Jr., T. L. Wilson, E. H. Melvin, and I. A. Wolff.
J. Am. Chem. Soc. 82(6): 1417-1421. March 20, 1960.

Dimorphecolic acid, the chief constituent fatty acid of *Dimorphotheca aurantiaca* seed oil, is characterized as an optically active 9-hydroxy-*trans,trans*-10,12-octadecadienoic acid.

HEMICELLULOSES OF THE CEMENTING LAYER AND OF SOME CELL WALLS OF THE CORN KERNEL.

H. L. Seckinger, M. J. Wolf, and Majel M. MacMasters.
Cereal Chem. 37(2): 121-128. March 1960.

Hemicellulose fractions of the cementing layer and of various cell walls in the corn kernel were analyzed by quantitative paper chromatography. Dilute acid hydrolysis of the cementing layer showed that it contained 60% polysaccharide composed of 55% arabinose, 31% xylose, and 14% glucose. Total nitrogen analysis indicated a protein content of 30%.

Cell walls of the scutellar parenchyma, scutellar epithelium, and endosperm were found to contain 50, 30, and 20% hemicellulose, respectively. On hydrolysis, hemicellulose of the endosperm cell walls yielded 34% arabinose, 35% xylose, and 31% glucose in contrast to the hemicellulose of the cell walls of scutellar parenchyma and epithelium, each of which yielded about 60% arabinose, 30% xylose, and 5% galactose. In addition, a small amount of glucose was found in the hydrolyzate of the cell walls of the scutellar parenchyma. No pectic substances were found in any of the cell walls examined.

LIST OF PUBLICATIONS AND PATENTS OILSEEDS AND RELATED SUBJECTS.
U. S. DEPT. AGR. ARS-71-5, Supplement 5. March 1960. 4 pp.

PILOT-PLANT PREPARATION OF HYDROXYETHYLATED FLOURS.
E. B. Lancaster and V. F. Pfeifer.
Cereal Chem. 37(2): 189-196. March 1960.

Reaction of ethylene oxide with various cereal flours was accomplished in a simple reactor that prepared 10-lb. batches of hydroxyethyl flours for evaluation studies. Methods were developed for integrating into the reaction mixture 2.5% of sodium hydroxide in a dry state. Some factors affecting the quality of the product and the rate of reaction are discussed.

PILOT-PLANT STUDIES ON THE CONTINUOUS BATTER PROCESS TO RECOVER GLUTEN FROM WHEAT FLOUR.
R. A. Anderson, V. F. Pfeifer, E. B. Lancaster, C. Vojnovich, and E. L. Griffin, Jr.
Cereal Chem. 37(2): 180-188. March 1960.

Certain variables involved in carrying out the continuous batter process for separating gluten and starch from wheat flour, such as water to flour ratio, retention time, temperature of mixing water, and mixer speed, were studied to determine their effect on gluten protein recovery and gluten purity. Generally, the recovery was increased by increasing the mixing-water temperature and by thickening the batter. However, the purity of the gluten product increased as the batter became thinner. Processing also appeared to be effected by ash content of the flour. As the ash content increased, less gluten was recovered, and the gluten also contained less protein.

Cost estimates for processing 200,000 lb. of flour daily to millstarch (crude starch slurry) and to wet gluten fractions indicate a plant investment cost of $316,000 and a processing cost of 26.5 cents per 100 lb. of flour processed.

PROCESS TO RECOVER MORPHINE FROM POPPY STRAW.
O. L. Brekke, G. C. Mustakas, M. C. Raether, H. G. Maister, and C. T. Langford.
North. Util. Res. Devlpmt. Div., ARS, USDA, Unnumb. Series, March 1960. 190 pp. (Processed)

This report summarizes pilot-plant results on the recovery of morphine from poppy straw. It includes an evaluation of the product, a description and analysis of a recommended commercial process, material balances related to design of a commercial-size poppy-processing plant, and estimates of the capital investment for such a plant, as well as operating costs.

A SEARCH FOR NEW FIBER CROPS.
H. J. Nieschlag, G. H. Nelson, I. A. Wolff, and R. E. Perdue, Jr.,[1] [1](USDA Crops Research Division, Beltsville, Md.)
TAPPI. 43(3): 193-201. March 1960.

In a continuing search for new fiber-producing plants a scheme to evaluate their potential as a possible source of papermaking pulp was devised. Included in the evaluation of the plants are their botanical characteristics, chemical composition, dimensional measurements of fibrous constituents, yield after sodium chlorite maceration, and a qualitative physical and visual appraisal. Data, including density measurements, on 58 plant species representing 11 families are reported. Fibers of the *Gramineae*, *Leguminosae*, and *Malvaceae* appear to be the most promising among the limited number of crop samples examined.

THE SEARCH FOR NEW INDUSTRIAL CROPS.

Quentin Jones[1] and Ivan A. Wolff. [1](USDA Crops Research Division, Beltsville, Md.)
Econ. Botany 14(1): 56-68. January-March 1960.

Identifying the present and future needs of industry for plant raw materials and directed screening and development toward these objectives through coordinated botanical and utilization research constitutes the approach being used in the U. S. Department of Agricultures' search for new industrial crops.

SOME OBSERVED SECONDARY EFFECTS OF HIGH-AMYLOSE GENES IN MAIZE.

M. S. Zuber,[1] C. O. Grogan,[1] V. L. Fergason,[1] W. L. Deatherage, and Majel M. MacMasters. [1](Crops Research Division).
Cereal Chem. 37(2): 212-217. March 1960.

In the material studied, in which the *ae* and *du* genes were each from a single source, generally as amylose content increased, protein content of the methanol-extracted (fat-free) endosperm increased. Likewise, as amylose increased, kernel weight decreased. When the high-amylose starch genes *ae* and *du* were considered individually, there was a high positive correlation between protein and amylose for the *ae* gene; whereas the *du* gene gave a significant negative correlation. Analysis of the phenotypes suspected of being the double recessive *ae du* indicated there was a negative relationship still between protein and amylose but not so large as for the *du* gene alone. There appeared to be a greater decrease in kernel weight as amylose increased for the *du* gene than for the *ae* gene. However, the possibility of developing high-amylose strains with a relatively low endosperm protein appears promising and worthy of special attention by breeders developing hybrids with high-amylose starch. Such hybrids would be especially beneficial to the corn wet-milling industry where current studies have shown considerable difficulty in the separation of gluten and starch from corn containing more than 50% amylose. *Ae* and *du* genes in other genetic backgrounds might give results different from those reported in this study.

TWO-STAGE PROCESS FOR DIALDEHYDE STARCH USING ELECTROLYTIC REGENERATION OF PERIODIC ACID.

V. F. Pfeifer, V. E. Sohns, H. F. Conway, E. B. Lancaster, S. Dabic, and E. L. Griffin, Jr.
Ind. Eng. Chem. 52(3): 201-206. March 1960.

In two-stage process for producing dialdehyde starch, iodic acid in aqueous solution is oxidized to periodic acid in an electrolytic cell, and starch is oxidized by the periodic acid solution in a separate vessel.

Variables involved in starch oxidation were investigated, including periodic acid purity, pH and temperature of reaction, concentration of reactants, and recycling purification of iodic acid for regeneration to periodic acid and re-use. Satisfactory pilot-plant reaction conditions were determined. The iodic acid solution resulting from reduction of periodic acid is recovered and recycled to the electrolytic cell for reoxidation. Loss of iodic acid is less than 1 lb. per 100 lb. of starch processed.

Cost estimates indicate that dialdehyde starch of high oxidation and alkali solubility can be produced economically.

THE ZYGOSPORIC STAGE OF THE GENUS *PIRELLA* (MUCORACEAE).

C. W. Hesseltine.
Am. J. Botany 47(3): 225-230. March 1960.

Pirella circinans Bainier has been found to be heterothallic. The zygospores, which have never before been reported, are formed when + and - strains are mated at 15° C. on such media as tomato paste-oatmeal or potato dextrose agars. Zygospores are formed in a diffuse manner in the aerial mycelium and are similar to those found in the genus *Mucor*. The single species, *P. circinans*, is described on a synthetic medium and its synonyms are listed. It is believed to represent a genus between *Mucor* and the family Thamnidiaceae.

EFFECT OF COMMERCIAL PROCESSING OF CEREALS ON NUTRIENT CONTENT A. MILLING. SECTION 1. WHEAT. SECTION 3. CORN.

Robert J. Dimler.
Chapter 5, pp. 197-204 and 214-216 of book entitled "Nutritional Evaluation of Food Processing," edited by Robert S. Harris and Harry von Loesecke, John Wiley & Sons, Inc., New York, April 1960.

The known effects that different types of milling have on the composition of wheat and corn are summarized and evaluated. The effect of refining flour or meal by removal of bran and germ fractions of the grain is emphasized.

EXTRACELLULAR INVERTASE PRODUCTION BY SEXUALLY AGGLUTINATIVE MATING TYPES OF *SACCHAROMYCES. KLUYVERI*.

Lynferd J. Wickerham and Robert G. Dworschack.
Science. 131(3405): 985-986. April 1, 1960.

Unisexual strains of both mating types of *Saccharomyces kluyveri* produce exceedingly high yields of extracellular invertase. Yields generally increase with an increase in the number of sets of chromosomes possessed by the unisexuals. The bisexual forms give small amounts in comparison.

HIGH-AMYLOSE CORNSTARCH--PROPERTIES AND PROSPECTS.

F. R. Senti and C. R. Russell.
TAPPI. 43(4): 343-349. April 1960.

This progress report on high-amylose corn starch acquaints potential users with this new industrial type of starch which is still in developmental stages. The cooperative program between plant breeders and chemists on the genetic increase of the amount of linear molecular amylose in corn starch above the normal level of about 27% is reviewed briefly. To date analyses of breeding samples have disclosed starch containing up to 82% amylose; corn having starch of 50 to 60% amylose is available in semicommercial quantities. Properties of amylose and amylopectin--the linear and branched molecular components of starch--and properties of the high-amylose starches thus far studied are described. Their industrial use in such fields as paper coating and food packaging are presented.

HYPOCHLORITE-OXIDIZED HIGH-AMYLOSE STARCHES. VISCOSITY BEHAVIOR.

R. L. Mellies, C. L. Mehltretter, and F. R. Senti.

J. Chem. Eng. Data. 5(2): 169-171. April 1960.

High-amylose corn starch requires greater chemical modification for good dispersibility than does ordinary starch. Viscosity properties of a series of high-amylose oxystarches using sodium hypochlorite were determined. The viscosity curves resemble those of ordinary oxystarches, but higher concentrations are needed for comparable results. Cold pastes of the lower oxidized high-amylose starches tend to separate. Viscosity of pastes increases on standing (setback).

Clarity increases with extent of oxidation, whereas settling volume increases to a certain level and then declines as dispersion supersedes swelling. High alkalinity aids the dispersion of high-amylose starch and oxystarches. Photomicrographs of slurries and pastes show the effect of oxidation upon granule swelling and disintegration.

MICROBIAL PRODUCTS IN ANIMAL FEEDS.

H. H. Hall.

Feedstuffs 32(17): 38, 40-42, 44, 68. April 23, 1960.

Microorganisms (including bacteria, molds, and yeasts) are a source of vitamins, antibiotics, proteins and amino acids, enzymes, and related factors used in animal rations to improve feed efficiency and to increase the rate of growth. Cereal grains, oilseed meals, and other agricultural products are the principal raw materials from which these feed supplements are derived by fermentation.

Continued research for new microbial products, added to those now available, will doubtless aid in meeting the challenge for increased efficiency in the mass production of poultry and livestock.

THE OZONIZATION OF METHYL OLEATE.

E. H. Pryde, D. E. Anders, H. M. Teeter, and J. C. Cowan.

J. Org. Chem. 25(4): 618-621. April 1960.

The effect of solvent on the ozonization of methyl oleate and on the reductive decomposition of the ozonolysis products has been studied. The use of a reactive solvent such as methanol or acetic acid resulted in isolated product yields of 87%. Carbonyl yields before isolation of product were on the order of 90-97%. The use of a nonreactive solvent such as ethyl-acetate or heptane resulted in low yield and impure products. The results are explained on the basis of the Criegee zeitterion mechanism for ozonization.

CHROMATOGRAPHIC METHOD FOR FRACTIONATING GLOBULINS OF CORN.

T. A. McGuire, E. M. Craine, and R. J. Dimler.

Cereal Chem. 37(3): 324-333. May 1960.

The globulins in water extracts of corn were fractionated by ion-exchange chromatography on carboxymethylcellulose (CMC). To increase solubility of the proteins at low pH, phytate ions were removed before chromatography. Proteins were adsorbed on unbuffered columns of CMC at low pH and ionic strength (1% acetic acid) and were desorbed by stepwise increases in the ionic strength of the eluant at constant pH (2.8). Rechromatography of components established that a true fractionation was obtained. Under conditions used, the unadsorbed material contained a true protein fraction, along with most of the yellow pigments and the nucleic acids of the extract. Evidence for an active nuclease was found.

CONDITIONING WHEAT FOR MILLING. A SURVEY OF THE LITERATURE.

Dorothy Bradbury, J. E. Hubbard, M. M. MacMasters, and F. R. Senti.
U. S. Dept. Agr., Misc. Pub. No 824, 147 pp., May 1960.

This literature survey on wheat conditioning fills a need of the miller and milling engineer for data fundamental for improving milling processes and increasing the use of flour in food or industrial products. It covers a period of 30 years from 1927 through 1957, and is divided into three sections: Part I summarizes a variety of conditioning methods (cold, warm, hot, steam, vacuum, ultrasonic, and infrared). Part II includes subjects relating to conditioning of wheat like hygroscopicity, absorption, and transmission of heat, and entrance of water into the wheat kernel. Part III is a bibliography of 666 references published in English and German, mainly, but also some French, Spanish, Portuguese, Hungarian, and Russian.

LYSINE, METHIONINE, AND TRYPTOPHAN CONTENT OF MICROORGANISMS. II. YEASTS.

G. E. N. Nelson, R. F. Anderson, R. A. Rhodes, Margaret C. Shekleton, and H. H. Hall.
Appl. Microbiol. 8(3): 179-182. May 1960.

The nitrogen, lysine, methionine, and tryptophan content of the cells of 271 strains of yeasts was determined. The results obtained from the analysis of individual strains are summarized according to the 32 genera and 1 miscellaneous group into which the yeasts were classified. The yeasts examined were found to contain from 3.8 to 10.2 g. lysine per 16 g. nitrogen (average 7.2), from 0.4 to 1.7 g. methionine per 16 g. nitrogen (average 1.2), and from 0.3 to 1.6 g. tryptophan per 16 g. nitrogen (average 0.8). The cells contained an average of 6.4% nitrogen. No correlation was found between the classification of the yeasts and the amount of the amino acids in the cell protein.

NEW POLYSACCHARIDE GUMS BY MICROBIAL SYNTHESIS.

V. M. Thomas and C. E. Rist.
Mfg. Chemist. 31(5): 206-208. May 1960.

The microbial gums, Phosphomannan Y-2448 and Polysaccharide B-1459, are produced in media containing low-cost corn sugar and corn steep liquor. Their properties and potential uses in pharmaceuticals sizing agents, adhesives, and chemical processes are described.

A NOTE ON AN IMPROVED DENATURATION TEST FOR GLUTEN BASED ON SOLUBILITY IN ACETIC ACID.

W. C. Schaefer, C. A. Wilham, R. W. Jones, R. J. Dimler, and F. R. Senti.
Cereal Chem. 37(3): 411-412. May 1960.

The solubility test of Blish was modified to extend its usefulness and to increase its speed, simplicity, and accuracy. Procedural details and typical results are given.

SEARCH FOR NEW INDUSTRIAL OILS. III. OILS FROM COMPOSITAE.

F. R. Earle, I. A. Wolff, and Quentin Jones[1] [1](USDA Crops Research Division Beltsville, Md.).
J. Am. Oil Chemists' Soc. 37(5): 254-256. May 1960.

Oils were extracted from 18 samples of seeds representing 17 species in 13 genera of the *Compositae*, and analyses were made to detect those of unusual or potentially valuable composition. Fatty acid composition has not been reported previously for 15 of these species. Most of the oils are high in diene in the traditional pattern of the *Compositae*, with one oil containing 76% of apparent linoleic acid.

Oils deviating from the typical pattern include 3 with more than 10% triene, 12 in addition to *Vernonia anthelmintica* apparently contain oxirane oxygen, 2 have appreciable hydroxyl content, and 1 in the conjugated diene.

WET-MILLING HIGH-AMYLOSE CORN CONTAINING 49- and 57-PERCENT-AMYLOSE STARCH.

R. A. Anderson, C. Vojnovich, and E. L. Griffin, Jr.
Cereal Chem. 37(3): 334-342. May 1960.

High-amylose corn with starch containing 49 and 57% amylose can be wet-milled, with some modification in processing conditions, to produce a starch of slightly higher protein content, and in somewhat lesser yield, than is usually obtained from ordinary corn. A 64.4% yield of starch containing 0.51% protein was recovered from ordinary corn, as compared with a 43.5% yield of starch containing 0.7% protein from high-amylose corn (57%). An unusually large swelling of the corn kernels was observed during the steeping of high-amylose corn (57%). These kernels exhibited an increase of 128% of their original dry volume, as compared with a 63% increase in volume observed during the steeping of ordinary corn.

DISSOLVING PULPS FROM DOMESTIC TIMBER BAMBOO--*PHYLLOSTACHYS BAMBUSOIDES*.

T. R. Naffziger, R. S. Matuszewski, T. F. Clark, and I. A. Wolff.
TAPPI. 43(6): 591-596. June 1960.

Dry, mature timber bamboo--*Phyllostachys bambusoides*--was investigated as a raw material for preparing dissolving-grade pulps by prehydrolysis, sulphate-pulping techniques. Condition of the raw material and variables in the hydrolytic treatment were studied for their influence upon yield and characteristics of the pulps when pulping and bleaching conditions were kept constant. Nitric acid, steam, and water were used as hydrolytic agents. Pulps made under a number of combinations of these variables had chemical and physical characteristics in the range of those of commercial cellophane, textile, and medium-tenacity grades of dissolving pulps from woods.

FERMENTATION ACIDS. PRODUCTION, PROPERTIES, AND UTILIZATION. TECHNICAL LITERATURE AND PATENTS OF THE U. S. DEPARTMENT OF AGRICULTURE.

Compiled by Robert G. Dworschack.
U. S. Dept. Agr., ARS-71-15, June 1960. 15 pp. (Processed)

This bibliography is a compilation of technical publications and patents by workers in the U. S. Department of Agriculture on the fermentative production of organic acids. The references extend and supersede those issued February 1952 as AIC-322, entitled "The Production of Organic Acids by Fermentation."

FORMATION OF ISOMALTOSE IN ENZYMATIC DEXTRAN SYNTHESIS.

E. S. Sharp, Frank H. Stodola, and H. J. Koepsell.
J. Org. Chem. 25(6): 1062-1063. June 1960.

Isomaltulose was prepared from sucrose by the action of an enzyme preparation isolated from *Leuconostoc mesenteroides* (NRRL B-512F). The product gave fructose and glucose on hydrolysis and underwent alkaline rearrangement to yield aldose epimers. The phenylosotriazole of isomaltulose was shown by mixed melting point test and X-ray diffraction patterns to be identical with the corresponding derivative prepared from isomaltose.

SEPARATION AND DETERMINATION OF QUARTERNARY NITROGEN COMPOUNDS AND OTHER NITROGENOUS SUBSTANCES BY ION EXCHANGE CHROMATOGRAPHY. APPLICATION TO ANALYSIS OF CORN EXTRACTS.

D. D. Christianson, J. S. Wall, R. J. Dimler, and F. R. Senti.
Anal. Chem. 32(7): 874-878. June 1960.

A general procedure was developed for quantitatively separating mixtures of naturally occurring quaternary nitrogen compounds, including betaine, choline, stachydrine, trigonelline, and thiamine, by chromatography on a column of a sulfonated polystyrene resin in the acid form. Amino acids and certain other nitrogen compounds were also separated in this system. Use of appropriate methods permitted analysis for all of these substances in the effluent fractions of a single chromatographic separation. Basic principles governing the chromatographic behavior of quaternary nitrogen compounds on sulfonated resins in the acid form were demonstrated by their elution sequence. The applicability of the procedure to biological materials was shown by its use in characterizing and determining the free nitrogenous substances in extracts of corn grain.

SPECTROPHOTOMETRIC DETERMINATION OF BETAINES AND OTHER QUATERNARY NITROGEN COMPOUNDS AS THEIR PERIODIDES.

J. S. Wall, D. D. Christianson, R. J. Dimler, and F. R. Senti.
Anal. Chem. 32(7): 870-874. June 1960.

A rapid sensitive procedure was required for the detection and determination of betaines and other quaternary nitrogen compounds in the effluent of chromatographic columns employed for their separation from mixtures. An existing method for choline analysis was modified to determine additional substances by spectrophotometric measurement of their periodide derivatives. This was possible because ethylene dichloride solutions of the periodides of all quaternary nitrogen compounds tested including betaine, trigonelline, carnitine, stachydrine, and γ-butyrobetaine absorbed in the ultraviolet with maxima at 365 and 295 mμ. Acidification of the medium in which the periodides of the betaines were prepared by reaction with iodine resulted in their more complete precipitation. Iodine concentration, certain anions, temperature, and time also affected periodide yields.

CONTRACT RESEARCH PUBLICATIONS

(Report of research work done by an outside agency under contract with the U. S. Department of Agriculture and supervised by the Northern Utilization Research and Development Division of the Agricultural Research Service.)

CONVERSION OF CONJUGATED *CIS-TRANS* OCTADECADIENOATES TO THE *TRANS-TRANS* ISOMERS.

J. R. Chipault and J. M. Hawkins (Hormel Institute, University of Minnesota).
J. Am. Oil Chemists' Soc. 27(4): 176-182. April 1960.

EFFECT OF MALTING PROCEDURE AND WHEAT STORAGE CONDITIONS ON ALPHA-AMYLASE AND PROTEASE ACTIVITIES.

James R. Fleming, John A. Johnson, and Byron S. Miller.
Cereal Chem. 37(3): 363-370. May 1960.

EFFECT OF ENVIRONMENT, VARIETY, AND CLASS OF WHEAT ON ALPHA-AMYLASE AND PROTEASE ACTIVITIES OF MALTED WHEAT.
James R. Fleming, John A. Johnson, and Byron S. Miller.
Cereal Chem. 37(3): 371-379. May 1960.

PATENTS

These patents are assigned to the Secretary of Agriculture. Copies of patents may be purchased from the U. S. Patent Office, Washington, D. C.

DIFFERENTIAL AMMETER FOR ALTERNATING CURRENT MOTORS.
Carl B. Lancaster and Roy A. Anderson.
U. S. Patent 2,929,010, March 15, 1960.

An ammeter is modified for application to an a.c. motor so that only increases in motor load are measured. The resulting differential ammeter is connected to a conventional mixer operating under reduced voltage, and the consistency of the mixed material continuously recorded during mixing. The apparatus is applied to doughs, batters, and pastes.

STARCH PRODUCTS OF STABLE VISCOSITY.
Bernard T. Hofreiter, Charles L. Wehltretter, James Bennie, and George Earle Hamerstrand.
. S. Patent 2,929,811. March 22, 1960.

A modified starch in the physical form of ungelatinized starch granules having the properties of improved viscosity stability and clarity of its aqueous dispersions under normal gelatinization condition, and nongelling of its cooled pastes, comprising the product of chemical reaction of ungelatinized starch, under conditions which maintain the unbroken granule structure of starch, with epichlorohydrin to effect cross-linking by etherification of the hydroxyl groups of the starch molecules to the extent of 200 to 2000 anhydroglucose units per cross-link followed by reaction with sodium periodate and chlorous acid, respectively, to form dicarboxyl units in the starch structure.

NOVEL REDUCTONES AND METHODS OF MAKING THEM.
John E. Hodge.
U. S. Patent 2,936,308. May 10, 1960.

Novel amino-glucose-reductones are prepared by heating an aminodeoxyketone in the presence of a reductone-forming catalyst. The anhydro derivatives are made by heating the reductones under nonhydrolyzing conditions in the presence of an acid agency.

COLOR SEPARATION PROCESS AND APPARATUS FOR THE REMOVAL OF IMPURITIES FROM WHOLE CORN KERNELS.
Frank C. Wohlrabe and Virgil F. Pfeifer.
U. S. Patent 2,937,750. May 24, 1960.

The process consists of delivering the mixture of corn kernels and rat excreta pellets in a singly layer stream under a source of illumination to pass under the field of scanning of a color differentiating apparatus such as a single cell or multiple photoelectric cells which receive the reflected light from the particles, the dark signal of the apparatus actuates a valve which opens to eject the rat pellets, and closes after the impurities are removed from the stream.

SULFATED CHLOROANKANOL DETERGENTS.
John C. Cowan, James Knerr Weil, and Alexander James Stirton.
U. S. Patent 2,938,872. May 31, 1960.
(Jointly with, but issued to EU).

Similar lists of publication abstracts and patents are available from the other three Regional Utilization Research and Development Divisions of the Agricultural Research Service, U. S. Department of Agriculture. The addresses and fields of research covered are:

Division	Principal Fields of Research
Eastern Utilization Research and Development Division 600 East Mermaid Lane Philadelphia 18, Pennsylvania	Eastern deciduous fruits; Eastern vegetables; meat; dairy products; animal fats; hides, tanning materials, and leather; honey; maple products; tobacco; allergens of agricultural products; and new crops.
Southern Utilization Research and Development Division Post Office Box 19687 New Orleans 19, Louisiana	Cotton, cottonseed; tung fruit; peanuts; rice; sugarcane; pine gum; citrus and other fruits; sweetpotatoes, cucumbers, and other vegetables.
Western Utilization Research and Development Division 800 Buchanan Street Albany 10, California	Western fruits, tree nuts, and vegetables; poultry products; alfalfa and other forage crops; wheat, rice, and barley; wool and mohair; sugar beets; dry beans and peas; castor and dimorphotheca; and selected new crops.